**Figure 1: Gestural input with drones [3].**

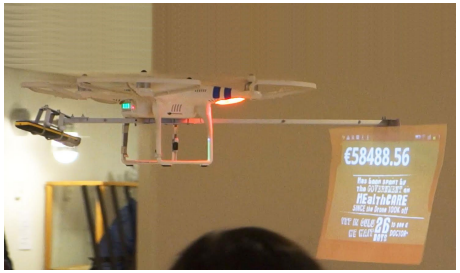


**Figure 2: Display drones [13].**

# iHDI: First International Workshop on Human-Drone Interaction

**Anke M. Brock**
ENAC, Université Toulouse
Toulouse, France
anke.brock@enac.fr

**Jessica Cauchard**
Interdisciplinary Center (IDC) Herzliya
Herzliya, Israel
jcauchard@acm.org

**Markus Funk**
Technische Universität Darmstadt
Darmstadt, Germany
funk@tk.tu-darmstadt.de

**Jérémie Garcia**
ENAC, Université Toulouse
Toulouse, France
jeremie.garcia@enac.fr

**Mohamed Khamis**
University of Glasgow
Glasgow, United Kingdom
Mohamed.Khamis@glasgow.ac.uk

**Matjaž Kljun**
University of Primorska, HICUP Lab
Koper, Slovenia
matjaz.kljun@upr.si

## ABSTRACT

Commercial drones have recently been developed to encompass use cases beyond aerial photography and videography. Researchers have explored wider applications of drones including using drones as social companions, as key components in virtual environments, as assistive tools for people with disabilities, and even as sport companions. However the uptake of research in Human-Drone Interaction (HDI) also brought forth a plethora of challenges that are unique to this platform. While drones were



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initially considered as flying robots, recent works have shown that traditional Human-Robot Interaction (HRI) methodologies cannot simply be applied to HDI. For example, how do we deal with privacy and safety concerns associated with drones in public space? What is the appropriate methodology to evaluate HDI applications? How do the size, altitude, and speed of drones influence their perception? The aim of this workshop is to bring together researchers and practitioners from both academia and industry to identify: 1) novel HDI applications, and 2) key challenges in this area to drive research in the coming decade. The long-term goal is to create a strong interdisciplinary research community that includes researchers and practitioners from HCI, HRI, Ubiquitous Computing, Interaction Techniques, User Privacy, and Design.

## CCS CONCEPTS

• **Human-centered computing → Human computer interaction (HCI)**;

## KEYWORDS

Human-Drone Interaction, Unmanned Aerial Vehicles (UAV), Flying Robots, Quadcopters, Human-Robot Interaction

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## INTRODUCTION

In the last years, the adoption rate of personal and commercial drones has exponentially increased. This rapid growth is both exciting and frightening. On the one hand, drones are presenting new opportunities, with applications ranging from entertainment (Figures 2 and 3) to delivery, supporting people with special needs [1] (Figure 4), sports [12], pedestrian guidance [5], agriculture, and even search-and-rescue. On the other hand, many negative issues are arising around the adoption of drones and what it means to have them in our environments. The success and acceptability of this technology will depend on how well it can be used (Figure 1), integrated, and made acceptable to people. Many of these challenges fall in the realm of research in human-computer and human-robot interaction.

In this multidisciplinary workshop, we propose to bring together students, experienced researchers, and practitioners from diverse areas. We expect this workshop will raise interest to researchers from fields including, interaction techniques, autonomous vehicles, robotics, ubicomp, design, and cognitive science. In particular, we will foster discussions around interaction techniques, design, feedback

**Figure 3: Interactive games with drones [10].**

**Figure 4: Making HDI accessible to people with impairments.**

[1]https://balmoremedia.co.uk/

strategies, automation, control, trust, as well as privacy and ethical issues in HDI research. These topics are relevant to ensure the successful integration of the technology.

Through two hands-on sessions and group discussions with experts from both academia and industry, our goal is to address key questions around the design and methodologies, and bring a community together to develop new approaches for future human-drone interaction research. While, HRI research has been growing over the years, only few papers are presented at the CHI conferences. This workshop will give the opportunity for researchers in the HRI field to discover CHI and participate in our community.

This workshop will lead to a special edition of a journal, to help bridge the gap between the HCI and HRI communities in terms of methodologies for human-drone interaction research.

## ORGANIZERS

Our interdisciplinary organization team consists of 6 diverse international researchers from France, Israel, Germany, UK, and Slovenia. In addition, an industry partner from Balmore Group's Aerial Services division [1] confirmed their participation in the workshop.

**Anke Brock** is an Assistant Professor at ENAC in Toulouse, France. She is interested in building drone-based navigation systems [2], and making human-drone interaction accessible to people with impairments (Fig. 4).

**Jessica Cauchard** is an Assistant Professor at the Interdisciplinary Center (IDC) Herzliya, Israel where she heads the Ubiquitous Computing Lab. Jessica is interested in developing natural interfaces for human-drone interaction [3, 4, 7].

**Markus Funk** is a senior researcher (area head) at the Telecooperation Lab of the TU Darmstadt, Germany. Markus is interested in human-drone interaction and flying user interfaces [8, 11].

**Jérémie Garcia** is an Assistant Professor at ENAC in Toulouse, France. He is interested in designing interactions to author and operate automated systems such as drones or air traffic control [6].

**Mohamed Khamis** is a Lecturer (Assistant Professor) at the University of Glasgow in the UK. His research is at the intersection of Ubiquitous Computing and User Privacy. He is interested in understanding the privacy implications of drones, as well as developing novel input methods for human-drone interaction [9].

**Matjaž Kljun** is an Assistant Professor at University of Primorska (UP) where he co-directs HICUP lab (Humans Interacting with Computers at UP). Within the general HCI scope, he is also interested on how drones will become our companions [10].

## WEBSITE

The website will promote the workshop and serve as a platform to present the findings and foster the growing community of HDI researchers. It is available at: http://hdi.famnit.upr.si/.

## PRE-WORKSHOP PLANS

Prior to the workshop, we will open a web submission form, issue a call for participation, advertise the workshop, select position papers and contact authors with relevant information.

The call for participation will be broadly distributed to the different research communities addressing the subject of the workshop. This includes posting to mailing lists (e.g., chi-announcements), on social medias (e.g., Facebook and Twitter), and using the organizers' personal networks to contact leading researchers with relevant contributions in the area.

Potential participants will be asked to submit a 2 to 6-page position paper in the CHI Extended Abstract format by February 12th, 2019, along with three topics which they would like to discuss during the workshop, and with their preference of presentation format (poster or oral presentation). Papers may be submitted with organizers as authors or co-authors. We will encourage authors to consider broader implications of HDI and HCI, and where appropriate, implications for related fields such as robotics. Participants will also be encouraged to bring in new perspectives. We will seek submissions from HCI and HRI researchers already familiar with mainstream HCI, as well as cutting edge drone and robot researchers who are less familiar with HCI, but who believe their work may have wider implications for interactivity. We will also encourage submissions from researchers in any area of HCI with insights relevant to HDI.

An Easychair account will be used for submitting the position papers[2]. Each paper will be reviewed by at least two of the workshop organizers. All organizers will take part in reviewing. The organizers will select around 12 position papers for presentation at the workshop, and authors will be informed of acceptance on or before March 1st, 2019. Papers will be selected based on quality and relevance to the workshop topic and goals. Accepted position papers will be uploaded to the workshop website. Participants will be asked to read all of the accepted position papers in advance of the day so that they may come to the workshop primed with relevant questions and discussion points.

[2]https://easychair.org/conferences/?conf=hdi2019

## WORKSHOP STRUCTURE

The timeline for the workshop is shown in Table 1. First, the organizers will introduce themselves and talk briefly about the aim and scope of the workshop. Participants will then introduce themselves and their research interests in 30 seconds each.

**Individual Presentations:**

The morning will start with individual presentations of the position papers in one of two proposed formats: Short oral presentations (5 min) and poster presentations. We will invite pioneering researchers in the field of human-drone interaction to give a short keynote, with at least one researcher coming from academia, Prof. Roel Vertegaal from Queens University, Canada, and we are aiming to invite one from industry. This session will last up to 2 hours.

| | |
|---|---|
| 08:30-08:45 or 14.30-14.45 | Opening |
| 08:45-09:00 or 14.45-15.00 | 30-second introductions |
| 09:00-11:00 or 15.00-17.00 | Presentations and posters |
| 11:00-11:30 or 17.00-17.30 | Coffee break |
| 11.30-12.15 or 17:30-18:15 | Group activity 1 |
| 12.15-13.30 or 18.15-19.30 | Group activity 2 |
| 13.30-14.00 or 19.30-20.00 | Summary and Closing |
| | Lunch or Dinner |

**Table 1: Timeline**

**Group Activity 1:** After the coffee break, participants will be divided into groups. Drones of different shapes and sizes will be brought in to stimulate the discussions. Approval to bring drones to the venue has been obtained from the CHI 2019 general chair Prof. Stephen Brewster. Participants will be encouraged to engage with the drone on their table. Following the observation and engagement stages, participants will discuss in their group the current and future research problems in Human-Drone Interaction. They will be asked to prioritize the research problems according to their significance and the amount of efforts required for each problem to be solved. The results of this activity will be used as basis for the second activity.

**Group Activity 2:** Participants will be split into groups. Each group will focus on one of the themes identified in the first group activity and will discuss the upcoming steps to address this research problem. Each group will then be invited to present their outcome.

We will conclude by collecting feedback about the workshop and discussing the next steps the HDI community should undertake. We will encourage participants to start collaborating on the discussed themes and potentially submit new research work to the special journal issue.

## POST-WORKSHOP PLANS

Interacting with drones is a topic which has recently sparked much interest in the HCI community. Yet the HDI community is sparse and this workshop will give an opportunity for researchers in the field to meet and discuss the future of the field. We expect this workshop to influence future research in this area and help establish well-needed methodologies for HCI research with drones.

After the workshop, the organizers will prepare a report to be submitted to ACM Interactions Magazine. All accepted submissions will be published on the workshop website and on HAL (https://hal.archives-ouvertes.fr/browse/collection) which is indexed by Google scholar. Selected position papers' authors will be invited to submit for review longer versions of their submissions, including new material, together with a collaboratively produced paper. We plan to hold an open call in a special issue of a journal. The editors-in-chief of ACM THRI have been contacted and we are in the process of discussing the details of a human-drone interaction special issue to be published early 2020.

## CALL FOR PARTICIPATION

Drones are becoming increasingly ubiquitous to our environments. Many applications have appeared such as using drones for delivery, security, search-and-rescue, or even as companions. Such applications led to new challenges in the design and development of drone interfaces. In this First International Workshop on Human-Drone Interaction (HDI), through hands-on sessions and group discussions with experts, we provide this emerging field a platform to bring together researchers and practitioners. We seek to structure previous research efforts, identify new research directions, and define methodologies for this novel research area.

We seek high quality contributions that explore the advances and challenges in HDI, and that suggest new ways of interacting with drones. Submissions are invited in, but not limited to, the following topics:

- Novel applications
- Novel interaction techniques
- Manual control to autonomous applications
- Flying user interfaces
- First-person view flying
- Creating everyday interaction with drones
- Increasing safety and security
- Communicating drone interactivity
- Accessibility

Authors are invited to submit a 2 to 6-page position paper following the CHI Extended Abstracts format, on or before February 12th, 2019 at https://easychair.org/conferences/?conf=hdi2019.

The proceedings of the workshop will be published on the website and through HAL https://hal.archives-ouvertes.fr/, which is indexed by Google scholar. Selected authors will be invited to submit to a special issue in the THRI journal. Further information can be found on: http://hdi.famnit.upr.si

At least one author must attend the workshop. All participants must register for the workshop and at least one day of the conference.

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